(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 February 2003 (20.02.2003)

PCT

(10) International Publication Number
WO 03/014307 A3

(51) International Patent Classification[7]: C12Q 1/68, A01N 43/04, C07H 21/04, A61K 31/07

(21) International Application Number: PCT/US02/24920

(22) International Filing Date: 5 August 2002 (05.08.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/923,515 7 August 2001 (07.08.2001) US

(71) Applicant *(for all designated States except US)*: **ISIS PARMACEUTICALS, INC.** [US/US]; 2292 Faraday Avenue, Carlsbad, CA 92008 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **CROOKE, Rosanne, M.** [US/US]; 3211 Piraqua Street, Carlsbad, CA 92009 (US). **GRAHAM, Mark, J.** [US/US]; 2305 S. Ola Vista, San Clemente, CA 92672 (US).

(74) Agents: **LICATA, Jane, Massey** et al.; Licata & Tyrrel P.C., 66 E. Main Street, Marlton, NJ 08053 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
23 October 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 03/014307 A3

(54) Title: ANTISENSE MODULATION OF APOLIPOPROTEIN(A) EXPRESSION

(57) Abstract: Antisense compounds, compositions and methods are provided for modulating the expression of apolipoprotein(a). The compositions comprise antisense compounds, particularly antisense oligonucleotides, targeted to nucleic acids encoding apolipoprotein(a). Methods of using these compounds for modulating of apolipoprotein(a) expression and for treatment of diseases associated with expression of apolipoprotein(a) are provided.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/24920

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : C12Q 1/68; A01N 43/04; C07H 21/04, A61K 31/07
US CL : 435/6, 325, 91.1, 375; 536/24.5, 23.1, 24.3, 24.1; 514/44
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 435/6, 325, 91.1, 375; 536/24.5, 23.1, 24.3, 24.1; 514/44

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Biosis, Medline, CaPlus, Embase, Cancerlit

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KOSTNER et al. Lipoprotein (a): Still an enigma? Current Opinion in Lipidology. 2002, Vol. 13, pages 391-396.	15-20
A	JEN ET AL. Suppression of Gene Expression by Targeted Disruption of Messenger RNA: Available Options and Current Strategies. Stem Cells, 2000 Vol. 18, pages 307-	15-20
A	BRANCH, A. A Good Antisense Molecule is Hard to Find. TIBS. February 1998, Vol. 23, pages 45-50.	15-20
Y	McLEAN et al. cDNA sequence of human apolipoprotein (a) is homologous to plasminogen. Nature. 1987, Vol. 330, pages 132-137.	1-15
Y	WEINTRAUB, H.M. Antisense RNA and DNA. Scientific American. January 1990, pages 40-46, see entire article.	1-15
Y	MILLIGAN et al. Current Concepts in Antisense Drug Design. Medicinal Chemistry. 1993, Vol. 36, pages 1923-1937.	1-15
Y	US 5,801,154 A (BARACCHINI et al) 01 September 1998, see column 7 lines 6 and 22 and column 8 line 12; column 6 lines 12-17 and (column 4 lines 26-30.	1-15
Y	FRITZ et al. Cationic Polystyrene Nanoparticles: Preparation and Characterization of a Model Drug Carrier System for Antisense Oligonucleotides. Journal of Colloid and Interface Science. 1997, Vol. 195, pages 272-288.	1-15

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 February 2003 (03.02.2003)	16 JUL 2003
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230	Authorized officer Terra C. Gibbs Telephone No. (703) 308-0196

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/24920

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claim Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
Please See Continuation Sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.: Claims 1-20, SEQ ID NOs 7, 8, 19 and 36

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest.
☐ No protest accompanied the payment of additional search fees.

Group XXV, claims 1-20, SEQ ID NO: 31

Group XXVI, claims 1-20, SEQ ID NO: 32

Group XXVII, claims 1-20, SEQ ID NO: 33

Group XXVIII, claims 1-20, SEQ ID NO: 34

Group XXIX, claims 1-20, SEQ ID NO: 35

Group XXX, claims 1-20, SEQ ID NO: 36

Group XXXI, claims 1-20, SEQ ID NO: 37

Group XXXII, claims 1-20, SEQ ID NO: 38

Group XXXIII, claims 1-20, SEQ ID NO: 39

Group XXXIV, claims 1-20, SEQ ID NO: 40

Group XXXV, claims 1-20, SEQ ID NO: 41

As outlined above, this international searching authority has found 35 inventions claimed in the International Application covered by the claims indicated: Claims 1-20 which specifically claim sequences listed as SEQ ID NOs 7-41, which are intended to modulate the function and/or expression of human apolipoprotein a.

This international searching authority considers that the international application does not comply with the requirements of unity of invention (Rules 13.1, 13.2 and 13.3) for the reasons indicated below:

The inventions listed as Groups 1-XXXV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

According to the guidelines in Section (f)(i)(a) of Annex B of the PCT Administrative Instructions, the special techincal feature as defined by PCT Rule 13.2 shall be considered to be met when all the alternatives of a Markush-group are of similar nature. For chemical alternatives, such as the claimed antisense sequences, the Marksuh group shall be regarded as being of similar nature when
(A) all alterntives have a common property or activity and
(B)(1) a common structure is present, i.e, a signficant structure is shared by all of the alternatives or
(B)(2) in cases where the common structure cannot be the unifying criteria, all alternatives belong to an art recognized class of compounds in the art to whcih the invention pertains.

The instant antisense sequences are considered to be each separate inventions for the following reasons:

The sequences do not meet the criteria of (A), common property or activity or (B)(2), art recognized class of compounds. Although the sequence target and modulate expression of the same gene, each antisense sequence behaves in a different way in the context of the claimed invention. Each sequence targets a different and specific region of gene Y and each sequence modifies (either increases or decreases) the expression of the gene to varying degrees (per Applicants' Table I in the specification). Each member of the class cannot be substituted, one for the other, with the expectation that the same intended result would be acheived.

Further, although the sequence target the same gene, the sequences do not meet the criteria of (B)(1), as they do not share, one with another, a common core structure. Accordingly, unity of invention between the antisense sequences is lacking and each antisense sequence claimed is considered to constitute a special technical feature.

Applicants will obtain a search of the first sequence listed in the first invention. For every other sequence applicants wish to have searched, applicants need to elect the sequence and pay an additional fee.